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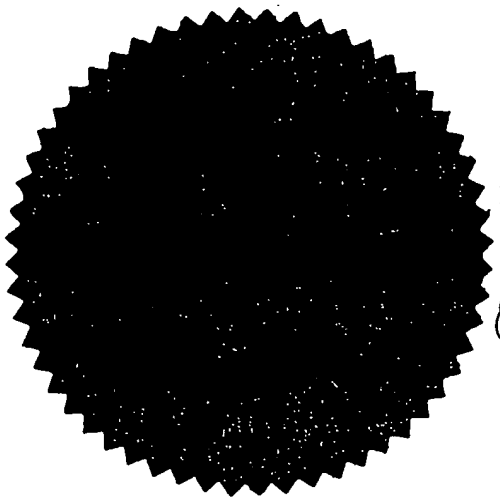
Certificate of grant of a patent

PATENTS ACT, 1992

It is hereby certified that a patent bearing the specification No. S74896 has been granted to ERIN INTELLECTUAL PROPERTY LIMITED, an Irish Company, of Derrinlough, Birr, County Offaly, Ireland, in respect of an invention entitled A mobile screen which invention was the subject of an application for that patent under Part III of the Act having a date of filing of 06 FEB 1997.



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(54) Title A mobile screen

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"A mobile screen" S970079

The present invention relates to a mobile sieving apparatus, and in particular, though not limited to a mobile screen for recycling materials such as waste and for aggregate and other quarried materials the apparatus being suitable for driving or trailing along a road.

Sieving apparatus such as mobile screens are known. A main constraint imposed on the design of mobile screens is a dimensional constraint. Mobile screens, if they are to be suitable for trailing or driving along a road or highway without requiring a special permit, must not exceed a predetermined maximum width, which is imposed on road vehicles by international road safety regulations. In general, the maximum width is approximately 2.9M.

The dimensional constraint is particularly onerous in mobile screens which are suitable for being fed by a loader bucket or back actor bucket. Typically, buckets have a longitudinal length of approximately 3M, and it is therefore essential that a screen suitable for being fed by such a bucket should have a hopper, one of the dimensions of which is not less than 3M. Accordingly, in order to adhere to international road safety

regulations whilst rendering the screen compatible with buckets most known mobile screens are provided with a hopper, the 3M dimension of which extends in the general direction of normal road motion of the screen. Therefore the 3M dimension of the hopper extends in a direction transversely of the rotational axis of the road wheels of the screen.

A further constraint on known screens is that the screen is generally disposed at an incline so that material travels downwards on the screen. Accordingly, it is necessary to feed material to be screened onto the screen at an upstream end thereof. Accordingly, the screen box in such mobile screens extends in direction parallel to the rotational axis of the road wheels. Therefore the screen box extends in a direction perpendicular to the 3M dimension of the hopper.

In short, because the screen box extends in a direction parallel to the rotational axis of the road wheels, the length of the screen box from the upstream end to the downstream end is limited to the maximum predetermined width dimension imposed on road vehicles, e.g. 2.9M referred to above. Moreover, conventional machines which are conveyor fed and may have a comparatively long effective screen length cannot be simply adapted

to a bucket fed format due to the aforementioned dimensional constraints. In addition, structural constraints also apply due to the location of the screen box and hopper - e.g. in order to receive from a conveyor a screen box and hopper must be comparatively high in the air which is usually too high to receive from a bucket. In addition, conveyor fed machines are structurally too weak to receive material from a bucket.

The screening efficiency of such mobile screens is therefore limited due to dimensional constraints, i.e. the relatively short length of the screen box reduces the effective screening length over which material to be screened can travel. For example, because of the short effective screening length, all the fines of the material are not screened from the reject material before the reject material is delivered from the screen box.

A further disadvantage of the machines of the prior art is that the machines deposit material comparatively close together so that fines and rejects material can mix following separation. Furthermore, conventional machines are not adapted to comprise three take-off conveyors whilst at the same time remaining road legal.

U.S. Patent No. 3,307,698 (Haffner) discloses a portable oscillating rock-separator. The rock-separator has a separator grid which is declined rearwardly. However, the rock-separator is adapted to be fed by a conveyor only and does not address the aforementioned dimensional constraints, and in addition, unlike modern mobile screens is not suitable for side loading by bucket.

A need exists for a mobile screen which overcomes the aforementioned problems.

An object of the invention is to provide a road legal mobile screen having a dimensionally unconstrained effective screening length.

A further object of the invention is to provide a mobile screen adapted to be side-loaded.

Yet a further object of the invention is to provide a mobile screen adapted to be fed by a bucket such as a back actor bucket or front loader.

According to the invention, there is provided a mobile screen comprising a main framework, at least one pair of ground engaging wheels carried on the main framework, the ground engaging wheels being rotatable

about a forward rotational axis, a screen box mounted on the main framework, at least one sloping screening deck mounted in the screen box, the screening deck having an upstream end and a downstream end, a screening length on the screening deck being defined between the upstream end and the downstream end, the screening deck having a first side and a second side, a screening width being defined between the first side and the second side wherein the screening length extends transverse to the forward rotational axis of the ground engaging wheels and is greater than the screening width and wherein the mobile screen is bucket loadable from a direction transverse to the screen length.

An advantage of the invention is that the effective screening length can be maximised to be dimensionally unconstrained while the screening width can be minimised to conform with transportation and safety regulations.

Suitably, the mobile screen further comprises a fines take-off conveyor, the fines take-off conveyor extending in a general upstream-downstream direction relative to the screen box, the upstream end of the fines take-off conveyor being located beneath the screen box.

Preferably, the mobile screen further comprises a rejects take-off conveyor, the rejects take-off conveyor extending away from the fines take-off conveyor in a generally upstream-downstream direction relative to the screen box.

Suitably, a middles take-off conveyor is mountable adjacent the at least one screening deck.

More preferably, the downstream end of the fines take-off conveyor extends away from the upstream end of the screen box in an upstream direction.

Most preferably, the rejects take-off conveyor extends from the downstream end of the screen box in a generally downstream direction.

An advantage of the relative orientations of the rejects and fines conveyors is that rejects and fines materials are deposited a maximum distance apart.

Advantageously, the screen box comprises an upper screening deck and a lower screening deck disposed beneath the upper screening deck.

More preferably, the middles take-off conveyor extends transverse to the screen length.

Most preferably, the middles take-off conveyor is detachable from the mobile screen.

Preferably, a hopper for receiving material is mounted over the screen box.

More preferably, the hopper is mounted on the framework. Most preferably, the hopper is pivotably mounted on the main framework to render the angle of incline of the hopper adjustable.

Suitably, the hopper is supported on the pivotable subframe mounted between the main framework and the hopper.

Preferably, the pivotable subframe further supports a screen box and the fines take-off conveyor. More preferably, the screen box extends substantially the length of the hopper in the upstream-downstream direction and extends beyond the hopper in a downstream direction.

Suitably, the fines and rejects take-off conveyors are foldable to minimise the overall length of the mobile screen during road movement.

Advantageously, retractable ground-engaging stabilising

legs are extendable from the main framework for engaging the ground during screening.

Suitably, the mobile screen is suitable for trailing or driving along a road or other highway.

The invention also provides a mobile screen comprising a main framework, at least one pair of ground engaging wheels carried on the main framework rotatable about one or more rotational axes, a screen box mounted on the main framework, the screen box having an upstream end and a downstream end and extending in a direction between the upstream and the downstream end transversely to the rotational axes of the ground engaging wheels, a receiving hopper adjacent the upstream end of the screen box, the receiving hopper being of a length in an upstream-downstream direction for receiving material to be screened from a bucket loader or back actor bucket with a longitudinal axis of the bucket extending in an upstream-downstream direction relative to the screen box during loading of the receiving hopper.

In one aspect of the invention the length of the receiving hopper in the upstream-downstream direction is up to 3M in length.

The invention will be more clearly understood from the following description of embodiments thereof which is given by way of example only with reference to the accompanying drawings in which:

Fig. 1 is a longitudinal schematic cross-sectional view through a mobile screen according to the invention in the working position;

Fig. 2 is a schematic plan view from above of the mobile screen of Fig. 1 again in the working position;

Fig. 3 is a longitudinal schematic cross-sectional view through the mobile screen of Fig. 1 in the towing position;

Fig. 4 is a side elevation of the mobile screen of Fig. 1 in the towing position;

Fig. 5 is a side elevation of the mobile screen of Fig. 1 in the working position;

Fig. 6 is a side elevation of the mobile screen of Fig. 1 in the rowing position with the screen guards removed;

Fig. 7 is a side elevation of the mobile screen of Fig. 1 with the guards removed;

Fig. 8 is a side elevation of a portion of the screen box of the mobile screen of Fig. 1 with the fingers installed;

Fig. 9 is a side elevation of an alternative embodiment of the mobile screen of the invention having a third middles take-off conveyor, the fines take-off conveyor and the rejects take-off conveyor being in the working position, the middles take-off conveyor being in the non-working position;

Fig. 10 is a side elevation of the mobile screen of Fig. 9 with the middles take-off conveyor in the working position;

Fig. 11 is a schematic plan view from above of the mobile screen of Fig. 10;

Fig. 12 is an enlarged side elevation of a portion of the mobile screen of Fig. 9 in which the third middles take-off conveyor is not working;

Fig. 13 is an enlarged side elevation of the

mobile screen of Fig. 9 partly adapted to operate the third middles take-off conveyor;

Fig. 14 is a side elevation of the mobile screen of Fig. 13 in which adaptation for operation with the third middles take-off conveyor has been completed;

Fig. 15 is a schematic side elevation of the mobile screen of Figs. 9 to 14 in which the fines and rejects take-off conveyors only are in the working position, and

Fig. 16 is a schematic representation of the mobile screen of Figs. 9 to 15 in which the fines take-off conveyor, the rejects take-off conveyor and the middles take-off conveyor are in the working positions.

Referring to the drawings there is illustrated a mobile screen according to the invention indicated generally by the reference numeral 1 which is suitable for towing along a road or other highway. The screen 1 comprises a main framework 2 which rotatably carries a pair of ground engaging wheels 3 on an axle 5, the axis of which extends into the page in Figs. 1 and 3, and which extends transversely of the direction of normal towing

motion of the screen 1 which is in the direction of the arrow A. A tow hitch 6 is provided on the main framework 2 for engaging the fifth wheel (not shown) of a towing vehicle, typically, a tractor 8, which is illustrated in Fig. 4.

A vibrating screen box 10 is mounted within the main framework 2 and extends from an upstream end 11 to a downstream end 12 in a general direction which is in the direction of normal towing motion of the screen 1, namely, in the direction of the arrow A, and which is also transversely of the rotational axis of the ground engaging wheels 3. The screen box 10 is carried on a base frame 13 which is pivotally connected to the main frame 2 by a pivot shaft 14 for facilitating varying the angle of inclination of the screen box 10. An hydraulically operated ram 19 which is mounted between the main frame 2 and the base frame 13 towards the downstream end 12 of the screen box 10 pivots the base frame 13 about the pivot shaft 14 for varying the angle of inclination of the screen box 10 in the upstream-downstream direction. The base frame 13 and ram 19 can most clearly be seen in Figs. 6 and 7. The screen box 10 comprises an upper screening deck or cascade 15 of screening fingers 16 for initial screening of the material to be screened, and a lower screening deck or cascade 17 of screening fingers 18 located beneath the

upper cascade 15 for second screening of the material for screening fines from the material to be screened. The two tier arrangement of such screening decks or cascades 15,17 of screening fingers 16,18 respectively, will be well known to those skilled in the art. A vibrating mechanism (not shown) is provided for vibrating the screen box in conventional fashion.

A receiving hopper 20 for receiving the material to be screened from a bucket loader or back actor bucket is mounted on the main framework 2 above the screen box 10 at the upstream end 11 thereof. The receiving hopper 20 is dimensioned to have a longitudinal dimension L extending in the direction of towing motion of the screen 1 to be such for receiving material from the bucket loader or back actor bucket with the longitudinal axis of the bucket extending parallel to the direction of towing motion of the screen 1 during loading. In other words, the dimension L of the receiving hopper 20 is approximately 3M for receiving material to be screened from a 3M bucket loader or back actor bucket. Side walls 21 and end walls 22 of the receiving hopper 20 incline downwardly, inwardly for directing the material to be screened onto the upper cascade 15 of the screen box 10 towards the upstream end 11 thereof. The downstream end 12 of the screen box 10 extends beyond the receiving hopper 20, and the

screen box 10 inclines downwardly from the upstream end 11 to the downstream end 12 as is conventional for such screen boxes 10.

A fines take-off conveyor 25 is mounted to the main framework 2 and extends from beneath the screen box 10 for collecting fines therefrom in a general forward direction of the screen 1 from the screen box 10. The fines take-off conveyor 25 is formed in two sections 26,27 namely, an upstream end 26 which extends from beneath the screen box 10 and a downstream section 27 for delivering fines to a stockpile at a location forward of the screen 1. The upstream and downstream sections 26,27 are pivotally connected at 28 for facilitating folding of the downstream section 27 relative to the upstream 26 for reducing the overall length of the screen 1 for towing.

A rejects take-off conveyor 30 is pivotally connected to the framework 2 by a pivot connection at 31 and extends in a generally downstream direction rearwardly of the screen 1 from the downstream end 12 of the screen box 10 for collecting and delivering reject material from the upper and lower cascades 15,17 of the screen box 10. The rejects take-off conveyor 30 extends a reasonable distance rearwardly from the screen 1 for stockpiling rejects at a location remote

from the screen 1. The rejects take-off conveyor 30 is provided in two sections, namely, an upstream section 33 for receiving reject material from the screen box 10, and a downstream section 34 which delivers the rejects material to the stockpile. The upstream section 33 and downstream section 34 are pivotally connected at 35 so that the rejects take-off conveyor 30 can be folded as illustrated in Fig. 3 for facilitating towing of the screen 1. The upstream section 33 of the rejects take-off conveyor 30 is located relative to the downstream end 12 of the screen box 10 for receiving rejects material from both the upper and lower cascades 15,17.

Adjustable reinforcing linkages 37,38 are provided for supporting the fines take-off conveyor 25 and the rejects take-off conveyor 30, respectively, when both take-off conveyors 25,30 are in a working condition illustrated in Figs. 1 and 2. Hydraulic rams 39,40 are connected between the upstream and downstream sections 26,27, and the upstream and downstream sections 33,34, respectively, of the fines take-off conveyor 25 and the rejects take-off conveyor 30, respectively, for operating the take-off conveyors 25,30 between the working condition and a towing condition, illustrated in Figs. 3, 4 and 6. The fines and rejects take-off conveyors 25,30 may be operated for delivering fines at

various different heights.

A vibrating plate 41 extends rigidly in an upstream direction from the upstream end 11 of the screen box 10 and beneath the receiving hopper 20 for receiving material to be screened from the receiving hopper 20 and for urging the material onto the upstream end 11 of the screen box 10. The vibrating plate 41 is vibrated as a result of vibrations induced into the vibrating plate 41 from the screen box 10.

Drive motors (not shown) which are powered by a diesel engine (also not shown) which is mounted in the main framework 2 are provided for driving the fines take-off conveyor 25 and the rejects take-off conveyor 30. An hydraulic power-pack (also not shown) is also provided in the main framework 2 for powering the rams 39,40, and suitable control circuitry and valves are provided for operating the rams 39,40.

The mobile screen can also be completely electrically powered such that the conveyors 25, 30 and the rams 39, 40 are electrically powered. Alternatively, the mobile screen can be powered by a combination of electric and hydraulic power.

Retractable ground engaging stabilising means, namely,

retractable ground engaging legs 42 extend downwardly from the framework 2 and are operable from a retracted position spaced apart from the ground for towing, to an extended operating position engaging the ground for stabilising the screen 1 during screening.

In use, the fines take-off conveyor 25 and the rejects take-off conveyor 30 are folded into the towing condition when it is desired to tow the screen 1 along a road or highway. The screen 1 is hitched to the fifth wheel (not shown) of a tractor 8 or other suitable towing vehicle by the hitch 6 for towing along a road. When the screen 1 has been towed and positioned on the site at which screening is to be carried out, the tractor 8 is unhitched from the screen 1, and the retractable ground engaging stabilising legs 42 are extended downwardly to engage the ground for taking the weight of the screen 1 and for stabilisation thereof. The fines take-off conveyor 25 is operated into the working condition by the hydraulic ram 39 and the rejects take-off conveyor 30 is also operated into the working condition by the hydraulic ram 40. In this orientation the screen 1 is ready for use, and with the screen box 10 and the vibrating plate 41 all vibrating, and the fines take-off conveyor 25 and the rejects take-off conveyor 30 operating the material to be screened is loaded sidewardly into the receiving hopper

20 by a bucket loader or back actor bucket. In other words, the longitudinal axis of the bucket extends parallel to the upstream-downstream direction of the screen box 10 during loading of the material to be screened into the receiving hopper 20. The material is screened through the cascades 15,17 and fines are taken off by the take-off conveyor 25 and deposited in a stockpile to the front end of the screen 1. Reject material is delivered from the cascades 15,17 onto the rejects take-off conveyor 30 and is deposited by the rejects take-off conveyor 30 in a stockpile to the rear of the screen 1.

Figs. 9 to 16 show a second embodiment of the invention in which the mobile screen is similar to the screen of Figs. 1 to 8, namely, the mobile screen 1 comprises a main framework 2 which rotatably carries a pair of ground engaging wheels 3 on an axle 5. The mobile screen 1 is also provided with a tow hitch 6, a vibrating screen box 10 which extends from an upstream end 11 to a downstream end 12 as previously described and a receiving hopper 20 for receiving material to be screened.

The screen box 10 comprises an upper screening deck 15 and a lower screening deck 17 as previously described.

As shown in Fig. 9, the mobile screen is provided with a fines take-off conveyor 25 mounted on the main framework 2 and a rejects take-off conveyor 30 also mounted on the main framework 2 as previously described. Fig. 9 also shows an alternative arrangement for the fines take-off conveyor 25 and the rejects take-off conveyor 30 in which the angle of incline or decline of the take-off conveyors 25,30 can be adjusted. More steeply inclined conveyors 25,30 are shown in broken lines.

An important feature of the present embodiment is that the screen box 10, the hopper 20 and the fines take-off conveyor 25 are mounted on a pivotable sub-frame or chassis 56. The sub-frame 56 is mounted on the main frame or chassis 2 and is pivotable with respect thereto.

The angle of inclination of the sub-frame 56 with respect to the main-frame 2 can be adjusted as required to in turn adjust the angle of inclination of the fines take-off conveyor 25, hopper 20 and screen box 10. The relative positions of the hopper 20, screen box 10 and fines take-off conveyor 25 can therefore be maintained to optimise the performance and throughput of the mobile screen of the invention. The take-off conveyors 25,30, the screen box 10 and the hopper 20 are

therefore pivotable in order to adjust the mobile screen as required.

The mobile screen 1 of Fig. 9 is also provided with a third take-off conveyor, namely, a middles take-off conveyor generally indicated by the reference numeral 43 (shown in the non-working position). The middles take-off conveyor 43 is made up of two parts, a detachable side or transverse conveyor 44 which extends outwards from the mobile screen 1 transverse to the longitudinal axes of the fines take-off conveyor 25 and the rejects take-off conveyor 30. The middles side take-off conveyor 43 is detachable from the mobile screen. The middles take-off conveyor 43 is made up of a horizontal conveyor 45 mounted on the main frame 2 of the mobile screen between the wheels 3 and the link 6 intermediate the fines take-off conveyor 25 and the rejects take-off conveyor 30. As shown in the drawings, the horizontal conveyor 45 is not disposed beneath the side take-off conveyor 44 when not in use. Moreover, in the non-working position, the side take-off conveyor 44 is vertically mounted on the main frame 2 as shown in Fig. 9.

The middles take-off conveyor 43 can also be made up of a single unit i.e. the side take-off conveyor 44 and the horizontal conveyor 45 can be integral.

Alternatively, or in addition, the middles take-off conveyor 43 can be detachable from the mobile screen so that the take-off conveyor can be removed or installed when required.

Fig. 10 shows the mobile screen 1 of Fig. 9 with the middles take-off conveyor 43 in the working position. The fines take-off conveyor 25 and the rejects take-off conveyor 30 are oriented on the main frame 2 as previously described. As shown in the drawing, the horizontal conveyor 45 is rolled from the non-working position as shown in Fig. 9 to the working position beneath the side take-off conveyor 44. Typically, the horizontal conveyor 45 is slid in tracks or along rollers (not shown) provided in the main frame 2. The horizontal conveyor 45 is aligned with the side conveyor 44 in order to convey middles material discharged from the downstream ends of the screening decks 17. This shall be described more fully below.

Fig. 11 shows a top plan view of the mobile screen 1 of Fig. 10 with the side conveyor 43 in the working position as described.

As shown in the drawing, the side take-off conveyor 44 projects transversely outwards from the mobile screen. The horizontal conveyor portion 45 of the side take-off

conveyor 44 is concealed beneath the rejects take-off conveyor 30.

Fig. 12 shows an enlarged detailed view of the horizontal conveyor 45 and the side conveyor 44 portion of the mobile screen of Fig. 9 in the non-working position. As shown in the drawing, the horizontal conveyor 45 is mounted within a sub-frame 46 having a floor 47 and a side wall 48. The sub-frame 46 is suspended from the underside of the main frame 2 adjacent the rear wheel 3 as previously described. The horizontal conveyor 45 is slidable along the base 47 from the non-working position shown in Fig. 9 to the working position shown in Fig. 10. As shown in the drawings, the rejects conveyor 30 is disposed beneath the upper and lower screening decks 15,17 (not shown) in order to convey reject materials from the mobile screen as previously described. As the middles conveyor 43 has not been assembled, the mobile screen 1 is therefore adapted to produce two products, namely, a rejects product and a fines product as previously described.

The mobile screen is provided with an eyelet 49 which is attached to the underside of the upstream section 33 of the rejects conveyor 30. An hydraulic ram/cylinder arrangement 50 also extends between the underside of

the upstream section 33 of the conveyor 30 and a rear side post 51 of the main frame 2. The rear post 51 of the main frame 2 is disposed to the rear of the wheels 3 of the main frame 2. The hydraulic ram/cylinder arrangement 50 is attached to the upstream section 33 of the conveyor 30 at a point designated by the reference numeral 52 intermediate the eyelet 49 and the downstream section 34 of the conveyor 30.

A locating frame 53 is mounted on the main frame 2 and rises upwards from the main frame 2 and is located above the horizontal conveyor 45 in the non-working position.

The main frame 2 is also provided with a pivotable hinge arm 54 which extends between the main frame/chassis 2 and the free end of the upstream end 33 of the conveyor 30.

Figs. 13 and 14 are enlarged side elevations of the portion of the mobile screen shown in Fig. 12 but describes the steps required in order to adapt the mobile screen from the two product production format shown in Figs. 9 and 12 to the three product production format as shown in Figs. 10 and 14.

The adaptation or transformation sequence is as

follows:

1. The hydraulic cylinder/ram arrangement 50 is extended until the eyelet 49 is contiguous with the locating frame 53, i.e. is visible through the locating frame 53 (see Fig. 13).

2. A pivot pin (not shown) is then inserted through the eyelet 49 and the locating frame 53 to create a pivot point 55 as shown in Fig. 13.

3. The hydraulic ram/cylinder 50 is then retracted until the free end of the upstream section 33 of the conveyor 30 rotates about the pivot point 55 into the upward position shown in Fig. 14.

4. A fixing pin (not shown) is then passed through the hinge arm 54 to the chassis/main frame 2 to secure the conveyor 30 in position.

5. The pivoting pin is then removed from the pivot point 55. If desired, the angle of the rejects take-off conveyor 30 can also be adjusted at this stage by extending or retracting the hydraulic cylinders 50 as required.

6. The horizontal conveyor 45 is then slid along the

base 47 as previously described and located beneath the side conveyor 44.

7. The side conveyor 44 is then mechanically lowered into position to engage the horizontal conveyor 45. The horizontal conveyor 45 and the side conveyor 44 are subsequently locked in position.

In order to detach the side conveyor 44 from the horizontal conveyor 45 the above-mentioned steps are reversed to return the mobile screen to a two product mode.

In a modification to the present embodiment of the invention, the locating frame 53 can be formed as an integral component of the main frame or chassis 2. Alternatively, the chassis or main frame 2 can be profiled to define a suitable guide for the pivot point 55.

Figs. 15 and 16 show schematic representations of the relative positions of the conveyors in the two product and three product modes respectively.

As shown in Fig. 15, the rejects take-off conveyor 30 is disposed at the free downstream end of the upper and lower screening decks 15,17 in order to receive

material from the screening decks 15,17 which can not pass through the screening fingers of the screen decks 15,17.

Conversely, the fines take-off conveyor 25 is disposed substantially parallel with and directly beneath the lower screening deck 17 to receive material which can pass through the screening fingers of the upper screening deck 15 and the lower screening deck 17. Accordingly, the take-off conveyor 30 receives debris of multiple sizes whereas the fines take-conveyor 25 receives material of substantially a more uniform size. The direction of movement of material is indicated by arrows and the arrangement shown in Fig. 15 substantially corresponds to the device shown in Fig. 9.

As shown in Fig. 16, the rejects take-off conveyor 30 is disposed beneath the free end of the downstream section of the upper deck 15 only, the fines take-off conveyor 25 is located beneath the lower deck 17 as previously described in relation to Fig. 15 while the transverse middles take-off conveyor 43 is disposed transverse to the lower deck 17 and beneath the lower screening deck 17. Accordingly, as indicated by the arrows, material incapable of passing through the upper screening deck 15 is deposited on the rejects take-off

conveyor 30, material incapable of passing through the lower screening deck 17 is deposited on the transverse take-off middles conveyor 43 while material capable of passing through the upper and lower decks 15,17 is conveyed on the fines take-off conveyor 25 as previously described. The arrangement described in Fig. 16 substantially corresponds to the arrangement shown in Fig. 10, i.e. for the production of three products.

The arrangement of the third transverse middles take-off conveyor assembly is advantageous as the mobile screen 1 of the invention can be used in either two product or three product mode. The transverse middles take off conveyor 43 is also detachable from the mobile screen 1 so that the middles take-off conveyor 43 can be added to a standard two-product mobile screen of the invention. In an alternative embodiment, the middles take-off conveyor 43 can be pivotable to extend in a generally downstream direction, i.e. in a substantially similar direction to the rejects conveyor.

The advantages of the mobile screen according to the invention are many. A particularly important advantage of the invention is achieved by the arrangement of the screen box 10 and the receiving hopper 20. By virtue of fact that the receiving hopper 20 is arranged for

side loading as in the case of ordinary conventional mobile screens, the overall width of the screen can be maintained at a minimum. However, by virtue of the fact that the screen box is also located in the main framework so that the screen box extends from its upstream to its downstream end in a general direction of towing motion of the vehicle, the width of the screen (screening width) likewise can be maintained at a minimum, while at the same time, a relatively long screen box is achieved to provide an enhanced effective screening length. Accordingly, a much longer screening surface or length is provided than can be provided in the direct or bucket fed mobile screens known heretofore. In addition, the relative orientations of the screen box and take-off conveyors ensures that the mobile screen of the invention is road legal. By orienting the receiving hopper and the screen box as described, a particularly efficient screen is provided with a relatively long screen box or screening length, and a relatively long screening surface, while at the same time, the receiving hopper is arranged for side loading, thereby minimising the overall screening width of the mobile screen. Thus, the screen according to the invention is ideally suited for trailing along a road or other highway, and also provides efficient screening.

Other advantages of the invention are achieved by virtue of the fact that the fines take-off conveyor and the rejects take-off conveyor are both foldable from a working condition extending forwardly and rearwardly, respectively, of the mobile screen to a folded towing condition, thus minimising the overall length of the screen.

The relative orientations of the fines conveyor 25 and the rejects conveyor 30, i.e. the conveyors extend in opposite directions ensures that fines and rejects material can be stockpiled or deposited as far apart as possible unlike the devices of the prior art where stockpiling of fines and rejects occurs relatively close together and results in mixing of the fines and rejects material which clearly undermines the screening process. Accordingly, the arrangement of the mobile screens of the invention facilitate maximum effective screening lengths combined with maximum separation and segregation of fines and rejects material. Therefore the device of the invention facilitates the product of at least two stockpiles of material which are separate whilst also ensuring that the mobile screen is transportable and as compact as possible.

It will be appreciated that other suitable screen boxes besides that described may be provided, and in certain

cases, it is envisaged that a screen box with a single tier of screening fingers may be provided. It is also envisaged that other arrangements of fines take-off and rejects take-off conveyors may be provided, and it will of course be appreciated that while it is particularly advantageous to have the fines and rejects take-off conveyors foldable between a towing and a working condition, the fines and rejects take-off conveyors need to necessarily be foldable between two conditions.

While the drive motors for powering the conveyors have been described as being provided by diesel engines, any other suitable engines or motors may be provided. For example it is envisaged that electrically powered motors may be used.

The mobile screen of the invention can be powered or controlled by a combination of power packs e.g. the mobile screen can be diesel powered in combination with hydraulic motors as previously described or could be electrically powered with hydraulic motors or fully electric motors. Suitable combinations of power sources will be apparent to those skilled in the art.

It will also be appreciated that, in certain cases, the screen instead of being trailable, may be provided with its own motive power and cab, and would be drivable

independently of a tractor.

Alternatively, the mobile screen can be adapted to be independently mobile on tracks.

Accordingly, the mobile screen 1 can be adapted for two or three product use. In addition, various other adaptations can be made to the mobile screen of the invention. For example, the screening decks 15,17 can comprise screening fingers as previously described. However, if desired, the screening decks can be replaced with any suitable screening materials known in the art e.g. mesh frames, punch plates and piano wires etc.

A further advantage of the invention is that the presence of the onboard conveyors 25,30 and 43 facilitate streamlining of production and eliminate double handling of material. The fines conveyor 25 can load directly into a dump truck or create a large stock pile. The rejects conveyor 30 can feed a crusher, grinder or other equipment or create a stock pile as required. In addition, the middles conveyor 43 can be utilised to create a separate stock pile or indeed to feed a larger stockpiler.

The screen box 10 is preferably fitted with heavy duty

Cascade (Trade Mark) Grizzly fingers on the top screening deck and medium duty Cascade (Trade Mark) fingers on the bottom screening deck. The openings in the fingers can be adapted to suit the material being screened. In addition, the screen box 10 can be hydraulically elevated between approximately 14 and 20° (see Fig. 9) as previously described as required. In addition, the angle of Grizzly and Cascade (Trade Mark) fingers can be adjusted independently to suit operating conditions.

In a further embodiment of the invention, a sieving screen can be mounted over the hopper to provide yet an extra grade of separated material. The sieving screen can be a vibrating, fixed or tiltable screen as is known in the art. The sieving screen can be used in conjunction with two or three take-off conveyors as required.

The unique linkage system used to adapt the two product mobile screen to a three product mobile screen facilitates rapid and easy conversion as compared with devices of the prior art which are either incapable of adaptation or are extremely time consuming and irreversibly adaptable.

The overall ccmpact design due to the presence of

folding conveyors of the mobile screen in total minimises set up times prior to use and offers unrestricted flexibility during transport at a working site or between working sites.

Finally, a control console on the mobile screen can be used to allow an operator to perform all functions from a central location at ground level. For example, an operator can fold and operate the fines, middles and rejects conveyors, operate the screen box and vary the inclination of the conveyors and screen box as desired.

The mobile screen can also, if desired, be operated by a remote control system.

The invention is not limited to the embodiments hereinbefore described which may be varied in construction and detail.

CLAIMS

1. A mobile screen comprising a main framework, at least one pair of ground engaging wheels carried on the main framework, the ground engaging wheels being rotatable about a forward rotational axis, a screen box mounted on the main framework, at least one sloping screening deck mounted in the screen box, the screening deck having an upstream end and a downstream end, a screening length on the screening deck being defined between the upstream end and the downstream end, the screening deck having a first side and a second side, a screening width being defined between the first side and the second side wherein the screening length extends transverse to the forward rotational axis of the ground engaging wheels and is greater than the screening width and wherein the mobile screen is directly bucket loadable from a direction transverse to the screen length.

2. A mobile screen as claimed in Claim 1 further comprising a fines take-off conveyor, the fines take-off conveyor extending in a general upstream-downstream direction relative to the screen box, the upstream end of the fines take-off conveyor being located beneath the screen box.

3. A mobile screen as claimed in Claim 2 further

comprising a rejects take-off conveyor, the rejects take-off conveyor extending away from the fines take-off conveyor in a generally upstream-downstream direction relative to the screen box.

4. A mobile screen as claimed in Claim 3 further comprising a middles take-off conveyor mountable adjacent the least one screen deck.

5. A mobile screen substantially as hereinbefore described with reference to and/or as shown in the accompanying drawings.

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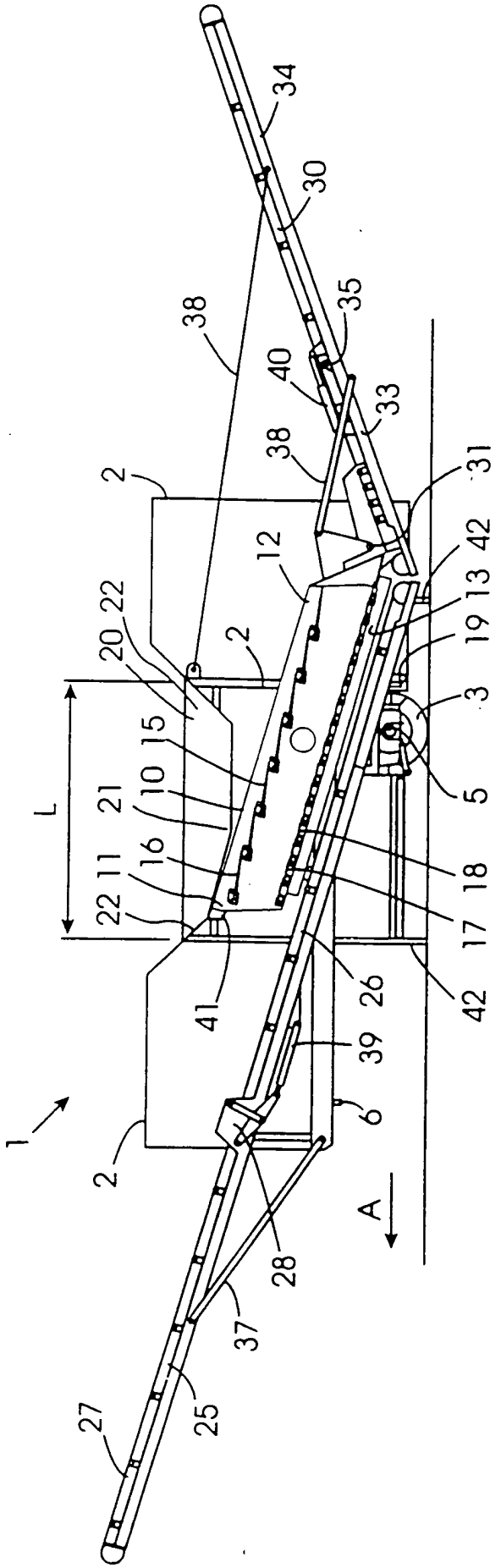
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Fig. 1

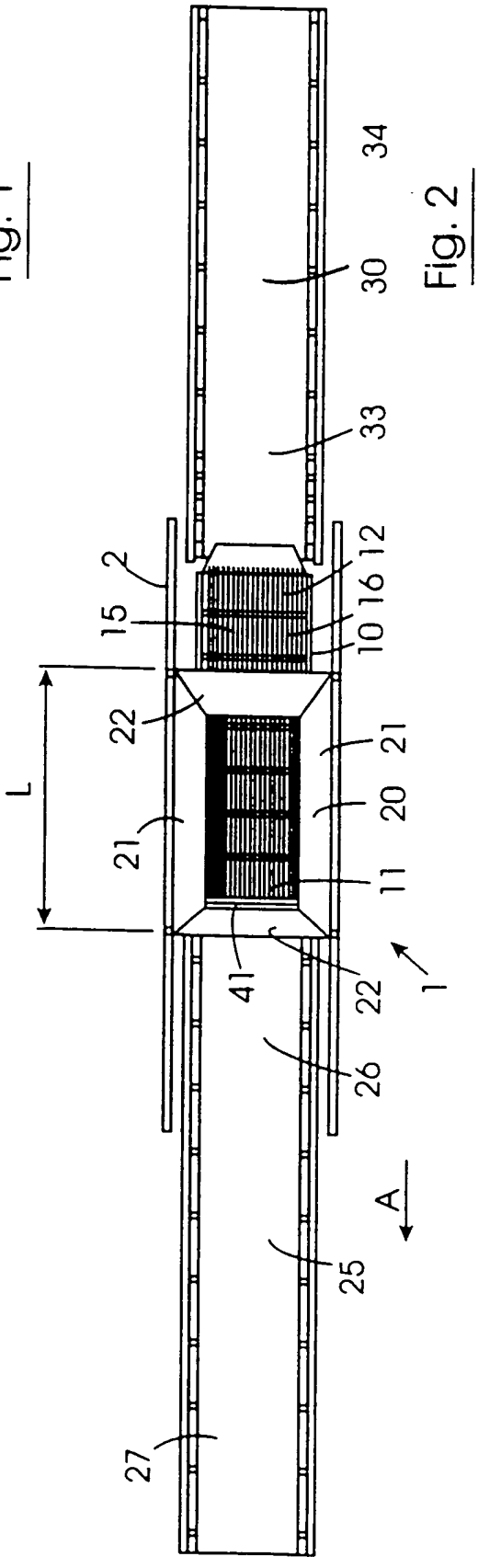
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Fig. 2

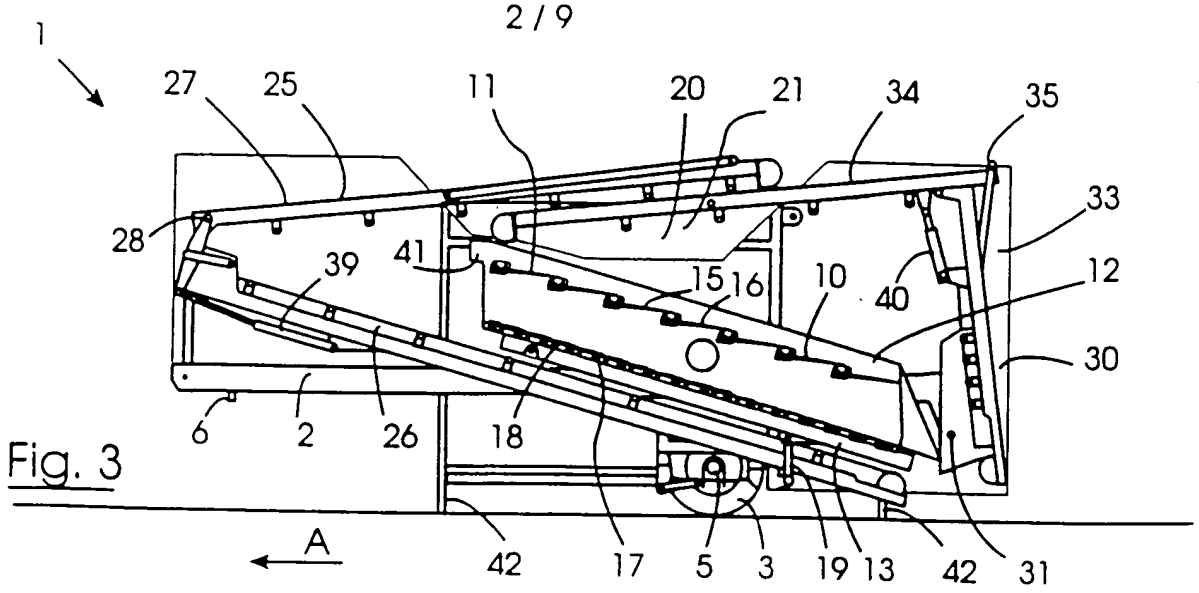

Fig. 3

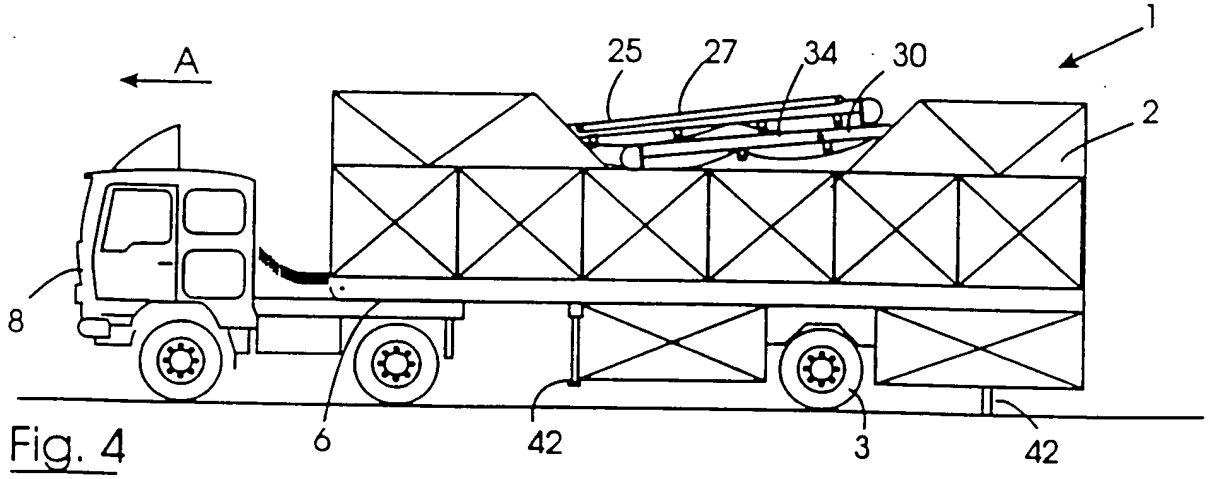

Fig. 4

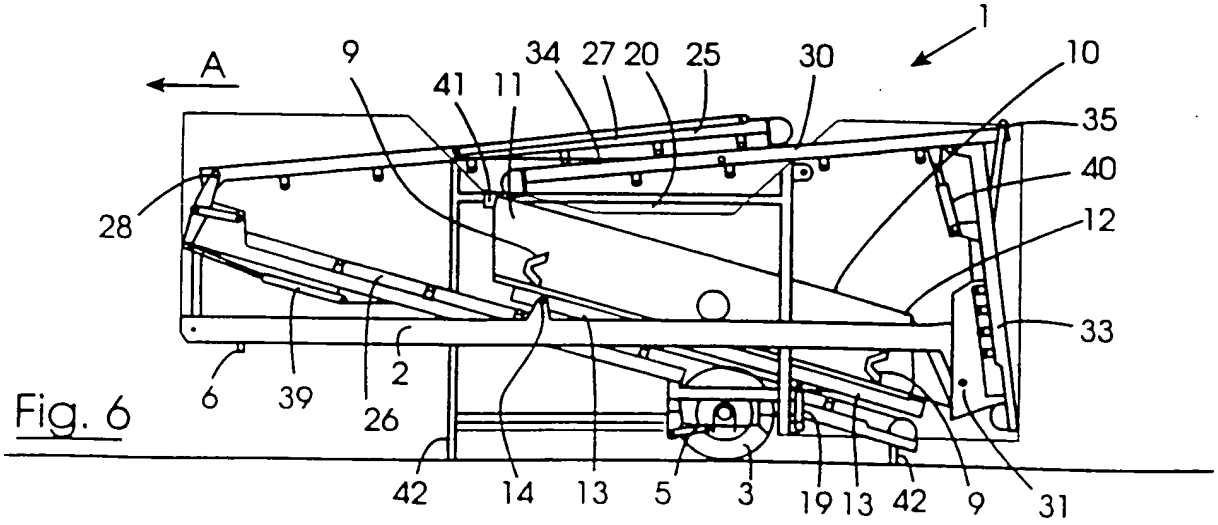

Fig. 6

Fig. 5

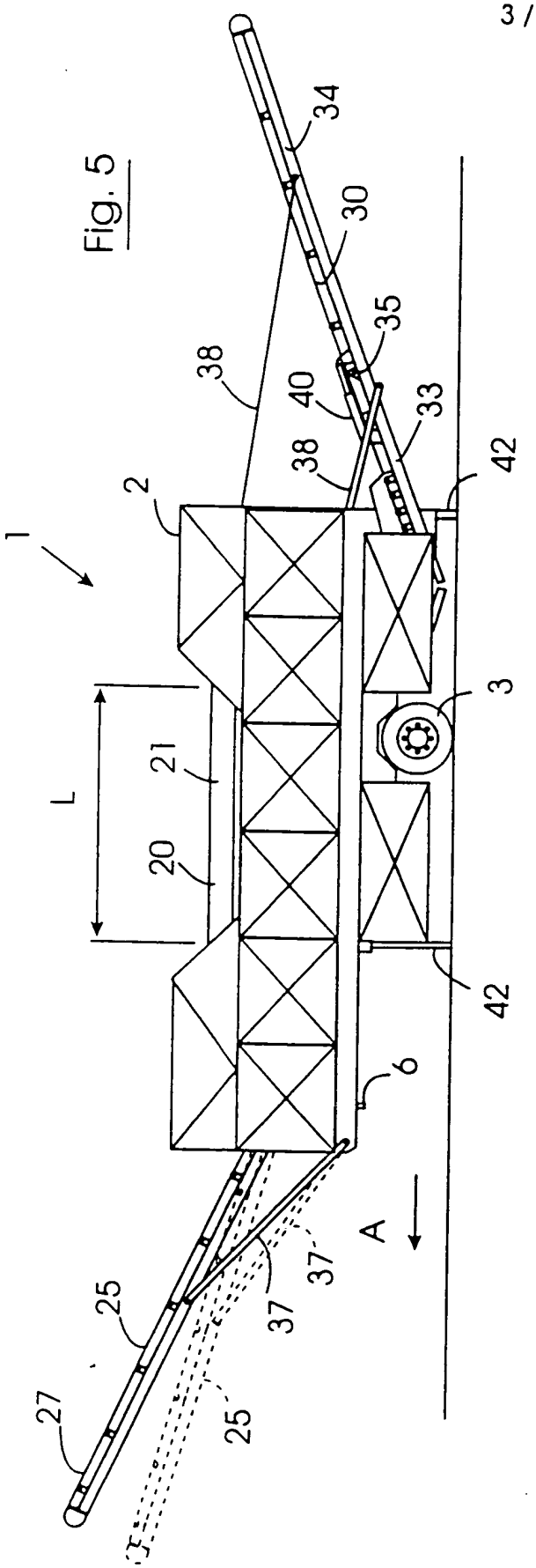
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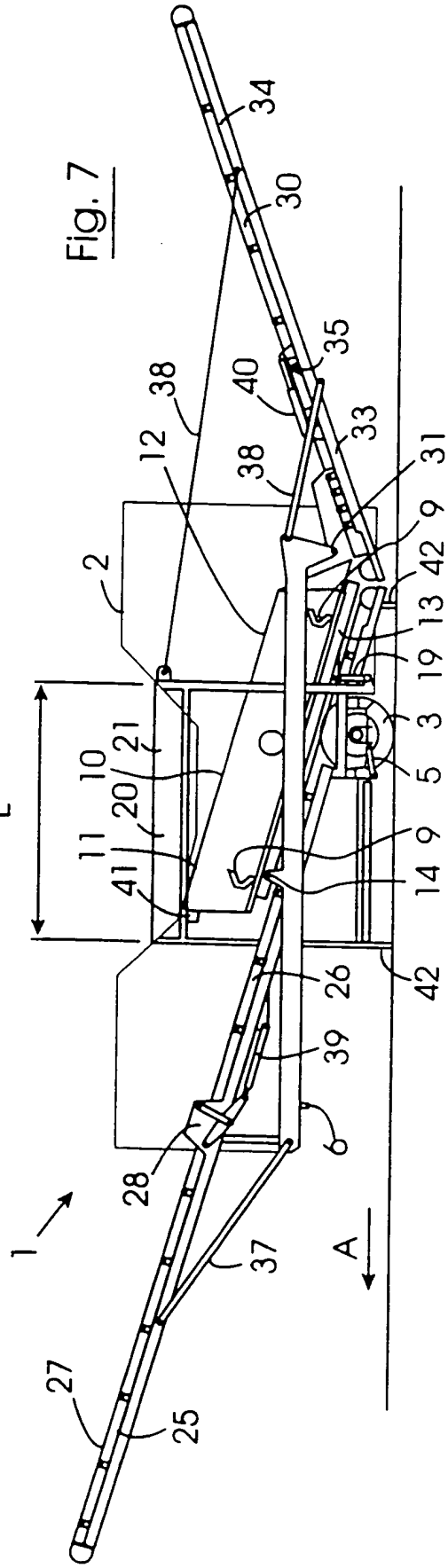
Fig. 7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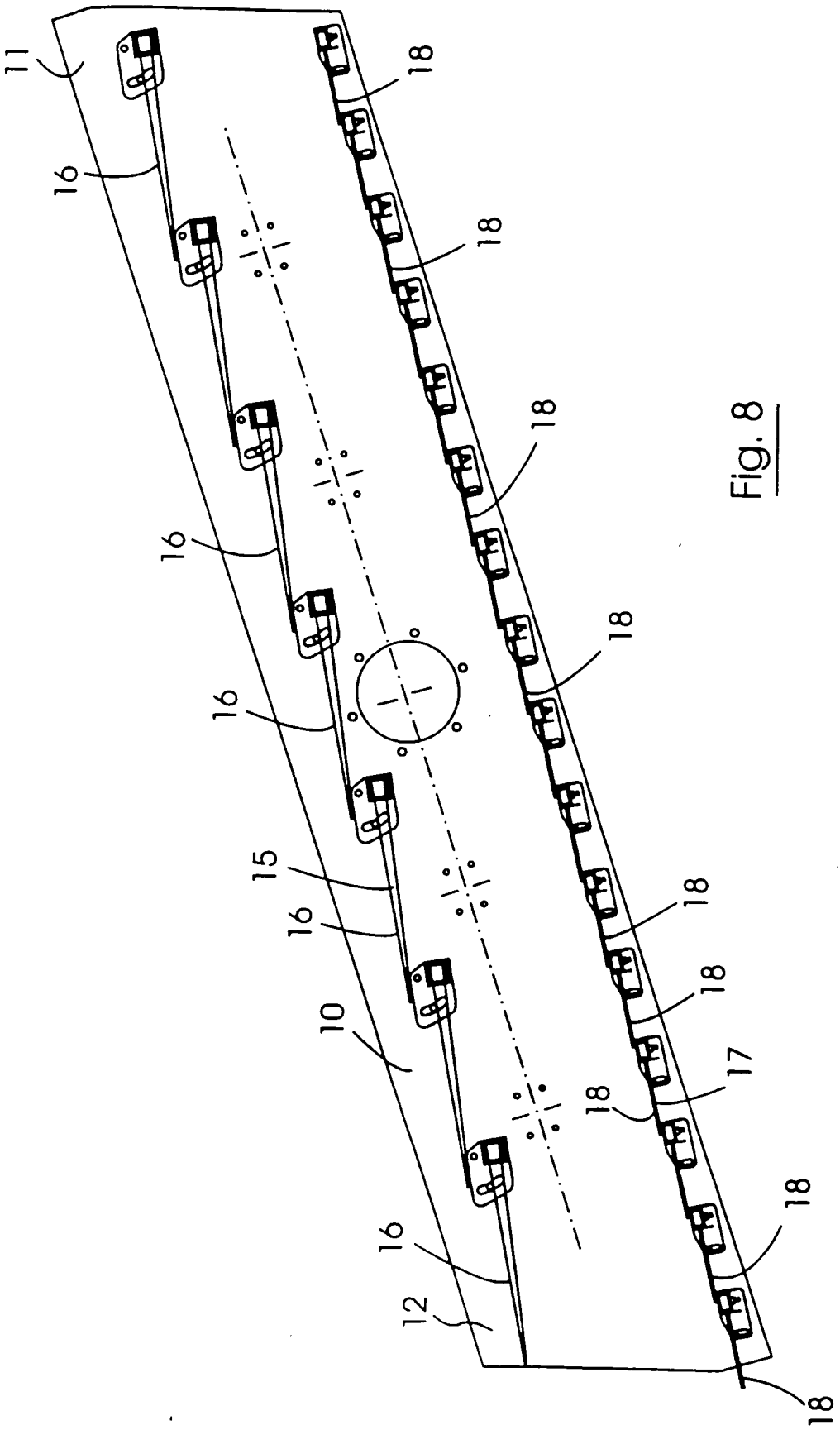

Fig. 8

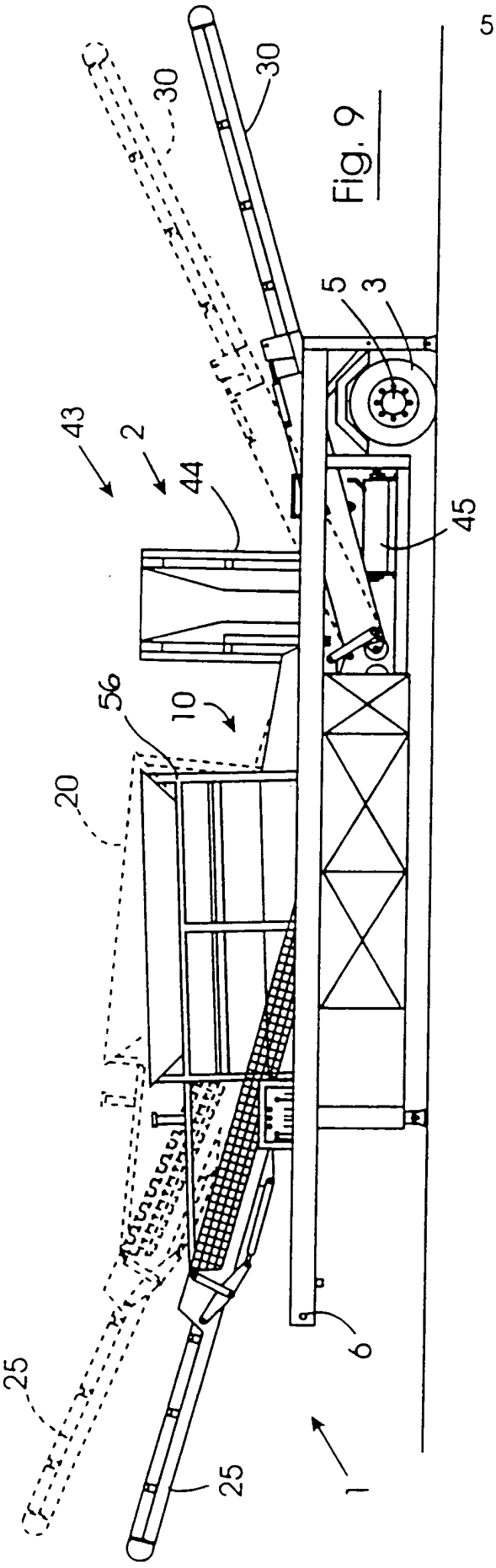

Fig. 9

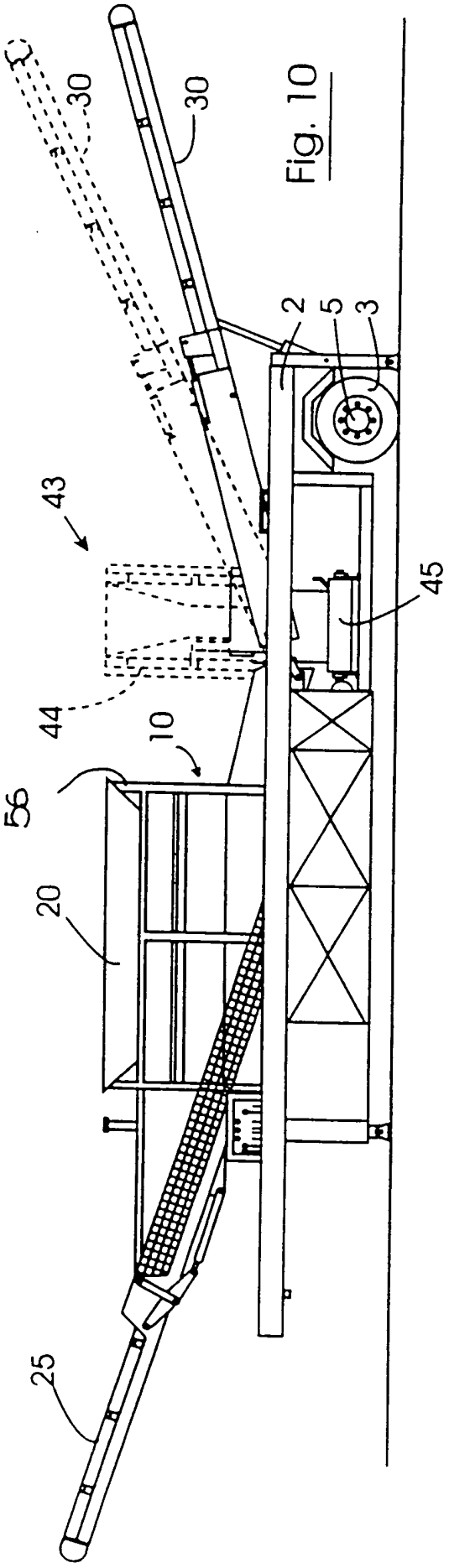

Fig. 10

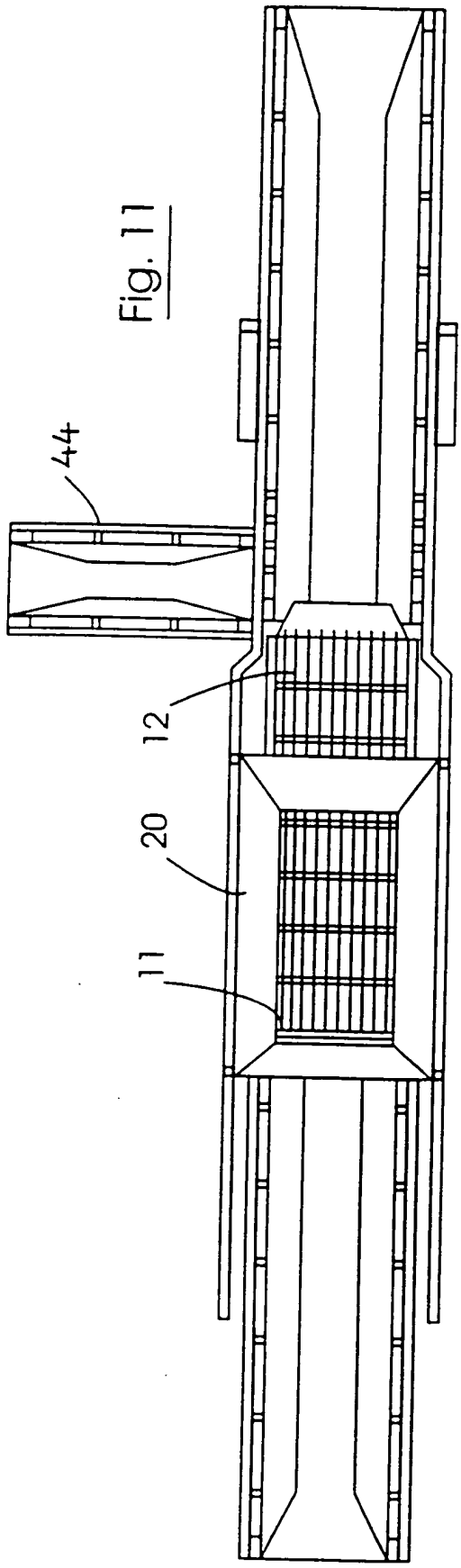

Fig. 11

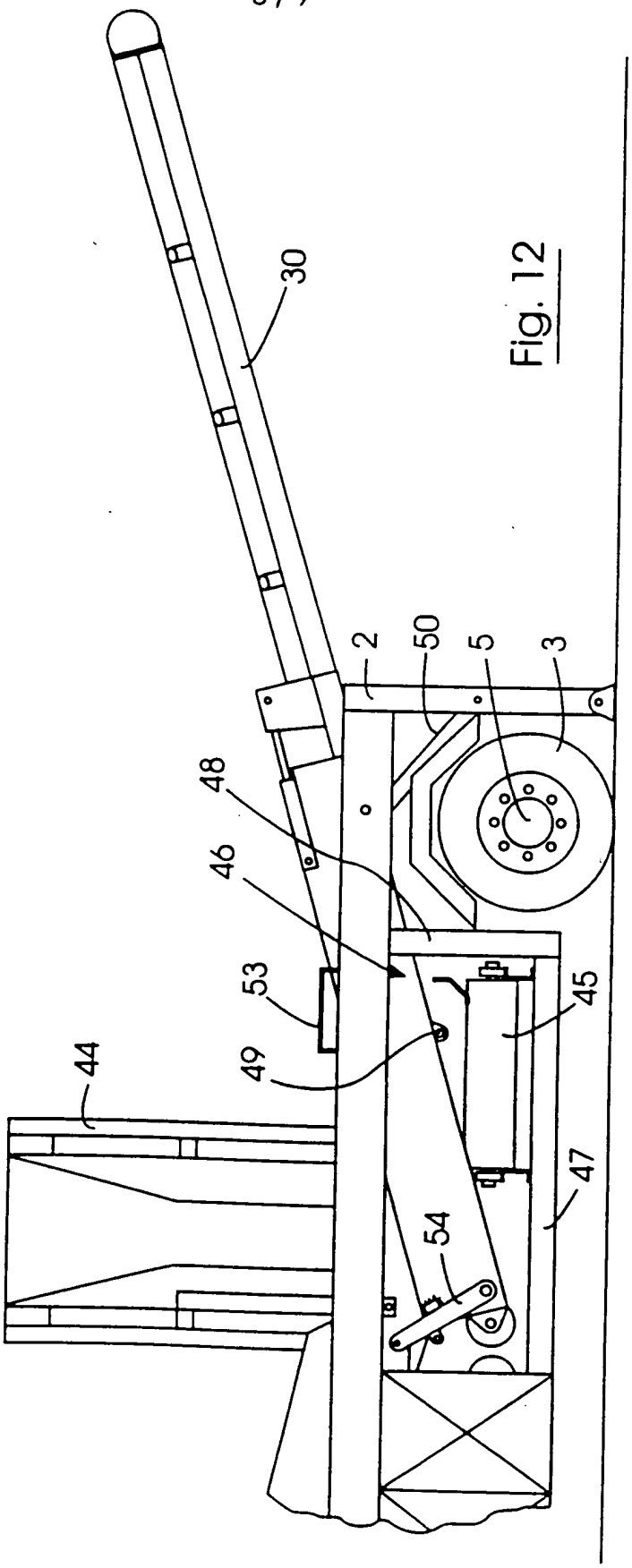

Fig. 12

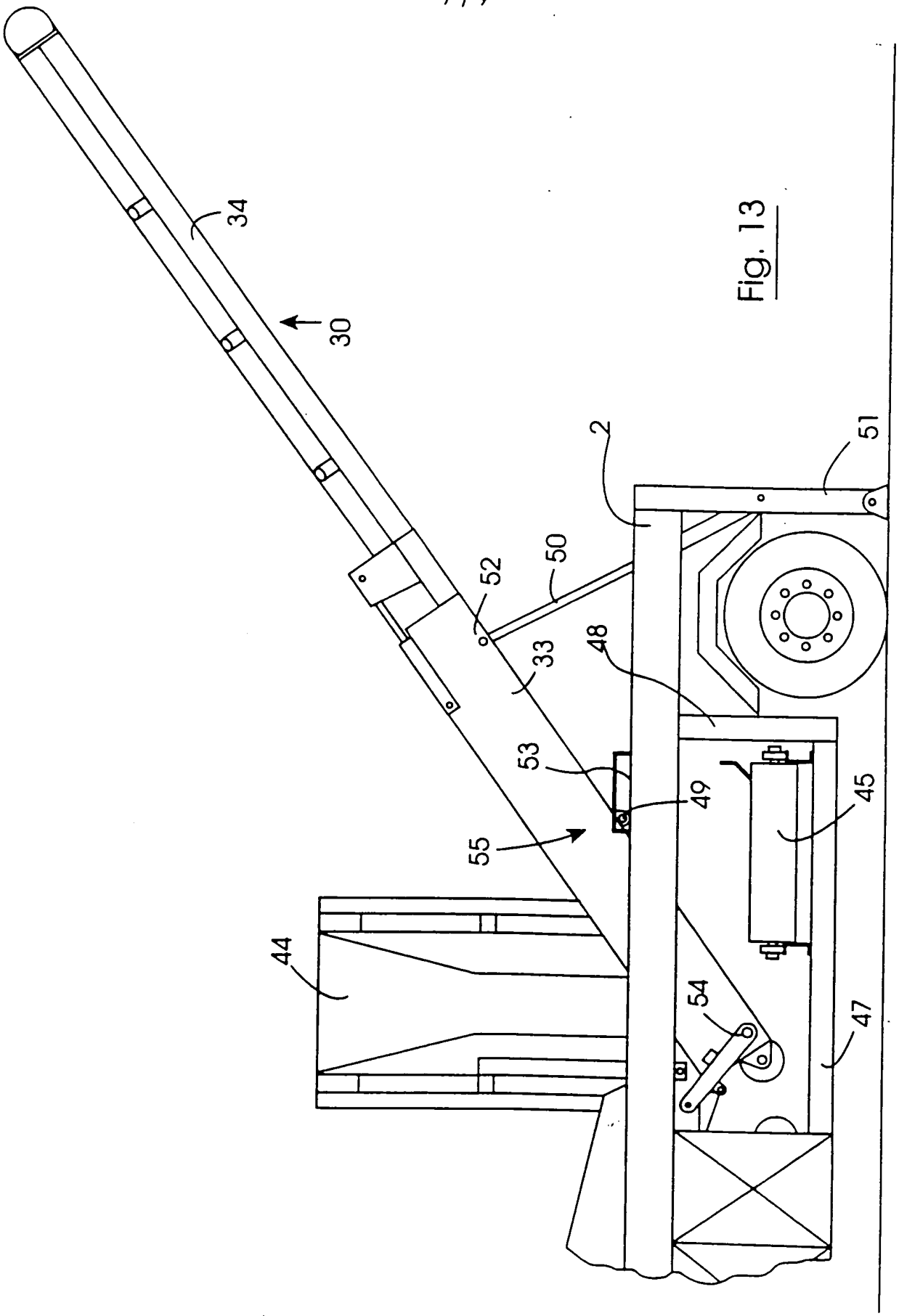

Fig. 13

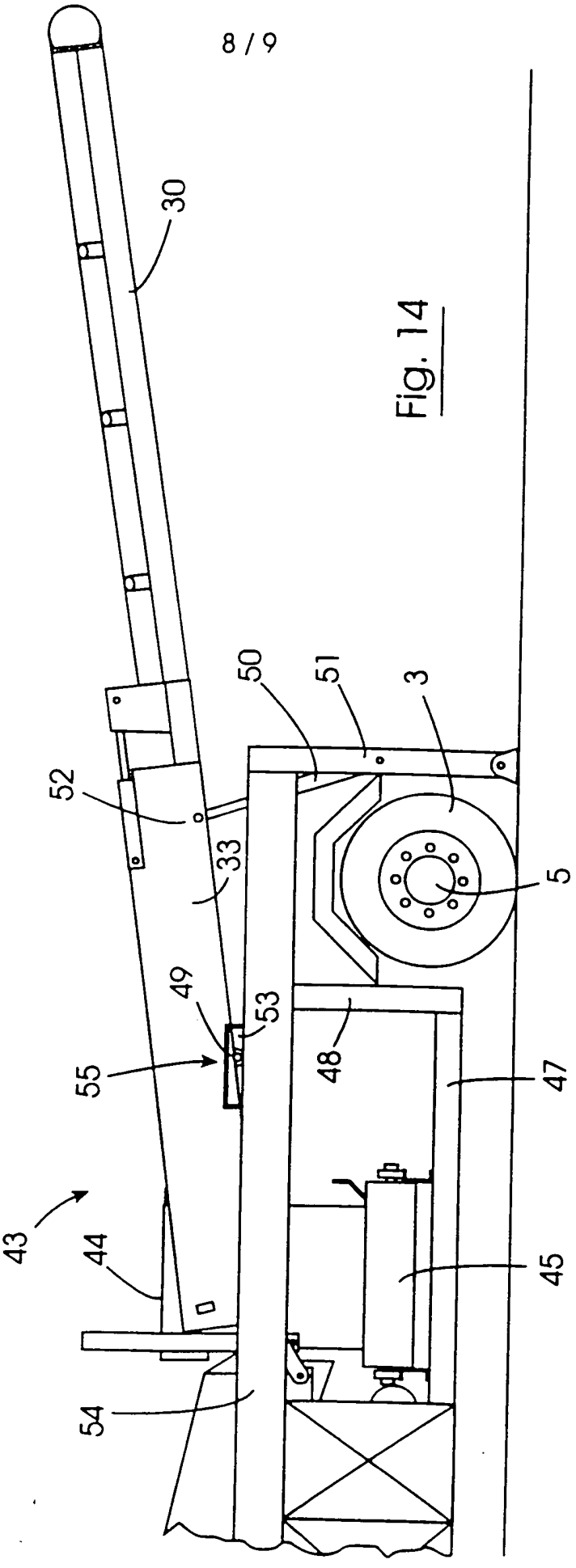

Fig. 14

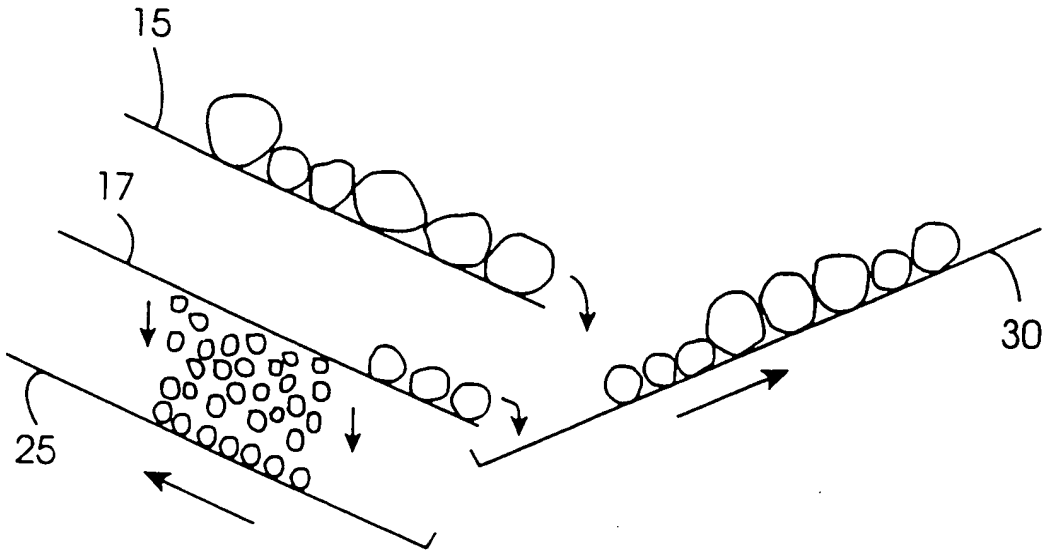

Fig. 15

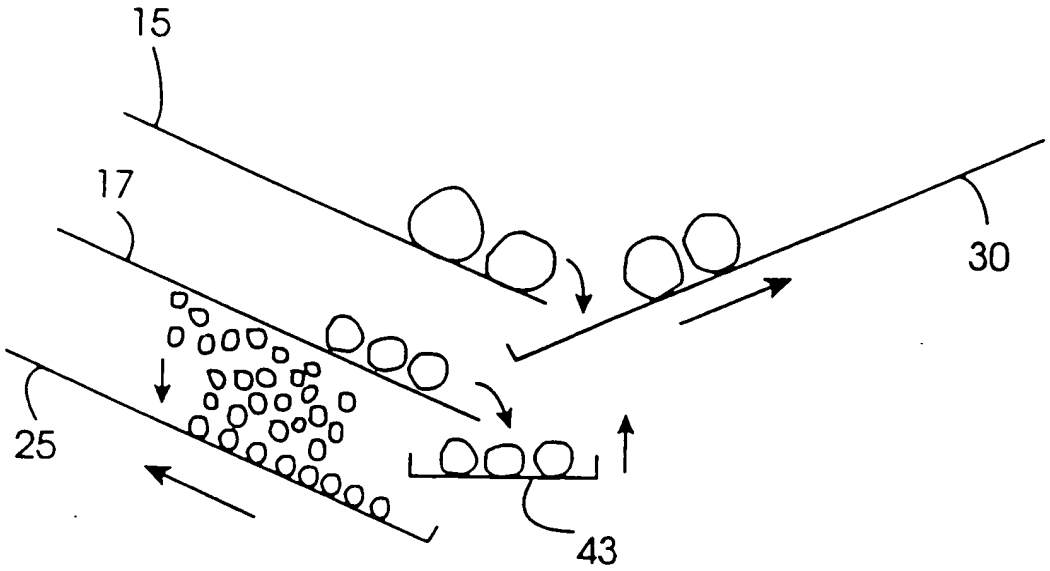

Fig. 16